

C. SCIENCE INQUIRY

<p>Content Standard: Students in Wisconsin will investigate questions using scientific methods and tools, revise their personal understanding to accommodate knowledge, and communicate these understandings to others.</p> <p>Rationale: Students should experience science in a form that engages them in actively constructing ideas and explanations and enhances their opportunities to develop the skills of doing science. Such inquiry (problem solving) should include questioning, forming hypotheses, collecting and analyzing data, reaching conclusions and evaluating results, and communicating procedures and findings to others.</p>			
Performance Standards: By the end of grade four students will:	Sample Alternate Performance Indicators: (1-3 per standard)	Sample Performance Activities/Tasks: (1-2 per indicator)	Sources of Data
C.4.1. Use the vocabulary of the unifying themes to ask questions about objects, organisms, and events being studied [2]	<p>1. Use examples to demonstrate the vocabulary of unifying themes [2]</p> <p>2. Classify questions related to and using the vocabulary of unifying themes [2]</p> <p>3. Generate questions using vocabulary related to unifying themes [2]</p>	<p>1.a. Complete experiments related to the unifying themes (1/2)</p> <p>1.b. List examples (in pictures, words, or symbols) from the student's own experience related to the unifying themes (2)</p> <p>2.a. Sort given questions according to the unifying themes(2)</p> <p>3.a. Participate in a discussion to form questions about completed experiments (2)</p>	
C.4.2. Use the science content being learned to ask questions, plan investigations, make observations, make predictions, and offer explanations [3]	<p>1. Identify and use prior knowledge related to content to ask question and plan investigation[3]</p> <p>2. Observe, predict, and explain based on experience/experiment[3]</p>	<p>1.a. Complete a KWL about science content (3) K = what you know W = what you want to know H = how will you find out L = what you learned</p> <p>2.a. Keep a journal (words, picture, chart) to record predictions, observations and explanations about seed growth or other experiments (3)</p>	
C.4.3. Select multiple sources	1. Identify multiple sources [2]	1.a. Create a source web of available information (2)	

of information to help answer questions selected for classroom investigations [2]	2. Select sources to answer specific questions [2]	2.a. Match questions to given sources (2) 2.b. In groups, find sources to answer given questions and present the findings (2)	
C.4.4. Use simple science equipment including rulers, balances, graduated cylinders, hand lenses, thermometers, and computers safely and effectively to collect data relevant to questions and investigations [1]	1. Identify the use of simple science equipment [1] 2. Use simple science equipment to complete an experiment [1]	1.a. Given a science problem, find the best equipment to solve the problem (2) 2.a. Measure objects, using a variety of tools (e.g., rulers, string, or paper clips) (1) 2.b. Collect data using simple science equipment safely (1)	
C.4.5. Use data they have collected to develop explanations and answer questions generated by investigations [3]	1. Apply collected data [3]	1.a. In groups, use collected data to explain investigations (3) 1.b. In a teacher-led discussion, form a question relevant to the investigation (3) 1.c. Based on collected data, answer generated questions (3)	
C.4.6. Communicate the results of their investigations in ways their audiences will understand by using charts, graphs, drawings, written descriptions, and various other means[3]	1. Summarize the results of investigation [3] 2. Express the results of investigation [3]	1.a. Create a picture, chart, physical model or other visual to show results of the student's investigation (2/3) 2.a. Use visuals to share the results of the student's investigation (2) 2.b. Lead other students in a demonstration to illustrate results of the student's investigation(3)	
C.4.7. Support their conclusions with logical arguments [3]	1. Support the conclusion [3]	1.a. Gather questions from the teacher and other students which challenge the student's conclusion (3) 1.b. Through demonstrations or pictures, defend against the challenges (3)	
C.4.8. Ask additional questions	1. Identify two more questions to further	1.a. Create a flowchart of the investigation with questions	

that might help focus or further an investigation [3]	an investigation [3]	located at the appropriate stages (3)	
Performance Standards: By the end of grade eight students will:	Sample Alternate Performance Indicators: (1-3 per standard)	Sample Performance Activities/Tasks: (1-2 per indicator)	Sources of Data
C.8.1. Identify questions they can investigate using resources and equipment they have available [1]	1. Identify questions to be investigated using resources and equipment available [1]	1.a. Complete a KWHL chart on a given problem (2) K = what you know W = what you want to know H = how will you find out L = what you learned 1.b. Generate questions to test buoyancy (2)	
C.8.2. Identify data and locate sources of information including their own records to answer the questions being investigated [2]	1. Identify and locate sources of information to answer the questions under investigation [2]	1.a. Read the food package labels to answer a specific question (1) 1.b. Use the library to locate information to answer a specific question (2) 1.c. Use the Internet to locate information to answer a specific question (2) 1.d. Use data collected from previous experiments to answer a specific question (2)	
C.8.3. Design and safely conduct investigations that provide reliable quantitative or qualitative data, as appropriate, to answer their questions [4]	1. Design and safely conduct an investigation to provide data to answer a question[4]	1.a. Design and conduct an experiment resulting in a chemical change and compare the substances' masses before and after the reaction (4)	
C.8.4. Use inferences to help decide possible results of their investigations; use observations to check their inferences [3]	1. Use inferences to help decide possible results of an investigation [3] 2. Use observations to check inferences	1.a. Using two-liter bottles, individually design a living ecosystem to survive for four weeks. Determine materials needed and organisms required (3) 2a. Observe their bottle ecosystem and make appropriate	

	[3]	adaptations (3)	
C.8.5. Use accepted scientific knowledge, models, and theories to explain their results and to raise further questions about their investigations [3]	1. Using accepted scientific knowledge, model a theory to explain the results or questions about investigations [3]	1.a. Using a drawing, explain why like charges repel and opposite charges attract(2)	
C.8.6. State what they have learned from investigations, relating their inferences to scientific knowledge and to data they have collected.[2]	1. State the information learned from investigations, relating inferences to scientific knowledge and to data collected [2/3]	1.a. Write a journal at the end of an investigation including: (1) what did I want to find out?; (2) how did I find it out?; and (3) reflections on the investigation (e.g., what does this result mean in relationship to my question?) (2/3)	
C.8.7. Explain their data and conclusions in ways that allow an audience to understand the questions they selected for investigation and the answers they have developed [3]	1. Explain data and conclusions in ways that allow an audience to understand the questions selected for investigation and the answers developed [3]	1.a. Formulate an investigations question, gather data draw a conclusion and present findings in a data table of a phi glass (3) 1.b. Use gathered information to construct a graph	
C.8.8. Use computer software and other technologies to organize, process, and present their data [2]	1. Use computer software to organize, process and present data [2]	1.a. Record plant growth in relationship to the amount of light the plants receive, and create a computer generated graph (3)	
C.8.9. Evaluate, explain, and defend the validity of questions, hypotheses, and conclusions to their investigations [3]	1. Explain the validity of a hypothesis to an investigation [3] 2. Defend the validity of a conclusion to an investigation[2]	1.a. Provide defensible reasons for a hypothesis based on background knowledge (e.g., Is there life on the moon?) (2) 2.a. Keep a record of all steps in an investigation and draw or photograph any physical changes (2) 2.b. Compare an investigation's results to the results found in textbooks and other resources (3)	
C.8.10. Discuss the importance of their results and implications of their work with peers,	1. Discuss the results' importance and the works' implications with peers, teachers, and other adults [3]	1.a. Participate in a science fair 1.b. Explain or present a science project to another class (2/3)	

teachers, and other adults [3]			
C.8.11. Raise further questions which still need to be answered[3]	1. Raise further questions which still need to be answered [3]	1.a. Use KWHL chart to raise questions for exploration (3)	
<i>Performance Standards: By the end of grade twelve students will:</i>	<i>Sample Alternate Performance Indicators: (1-3 per standard)</i>	<i>Sample Performance Activities/Tasks: (1-2 per indicator)</i>	<i>Sources of Data</i>
C.12.1. When studying science content, ask questions suggested by current social issues, scientific literature, and observations of phenomena; build hypotheses that might answer some of these questions; design possible investigations; and describe results that might emerge from such investigations	<p>1. Ask questions based on current issues, literature, and observations</p> <p>2. Build hypotheses</p> <p>3. Design investigations to answer questions</p> <p>4. Describe results of investigations</p>	<p>1.a. Compare science-related questions after discussing, reading, or watching a video concerning current issues, literature and observations.</p> <p>1.b. In a group, generate questions ups based on a demonstration or experiment.</p> <p>2.a. Utilize information from the student's prior knowledge and research to make a logical inference or hypothesis about a question's answer</p> <p>3.a. Design and complete a process to answer a specific question</p> <p>4.a. Based on their investigation present results to answer the question</p>	
C.12.2. Identify issues from an area of science study, write questions that could be investigated, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions	<p>1. Identify issues in an area of science</p> <p>2. Write questions related to an area of science</p> <p>3. Identify prior knowledge related to the questions</p> <p>4. Design and conduct safe</p>	<p>1.a. Given many issues, classify them into the science areas</p> <p>2.a. Brainstorm and subsequently classify questions from many science areas</p> <p>3.a. Relate research and prior knowledge to a selected group of science area questions</p> <p>4.a. With partners, formulate and conduct a process directly</p>	

	investigations to answer questions	related to a question	
C.12.3. Evaluate the data collected during an investigation, critique the data collection procedures and results, and suggest ways to make any needed improvements	<ol style="list-style-type: none"> 1. Establish parameters for evaluating data 2. Evaluate data collected in an investigation 3. Suggest ways to improve data-collection 	<ol style="list-style-type: none"> 1.a. Design a rubric or grading scale to evaluate data 2.a. After conducting an experiment, meet with other students to describe, compare, and critique the data collection process 3.a. In groups, list ways to improve data collection 	
C.12.4. During investigations, choose the best data collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data	<ol style="list-style-type: none"> 1. Choose the best data collection procedures 2. Use a data collection procedure competently 3. Calculate the degree of precision of the data collected 	<ol style="list-style-type: none"> 1.a. Given an investigation to complete and a variety of data collection options, select the best option 2.a. Collect and record data during an investigation 3.a. Review the results of the investigation to judge and report data collection accuracy 3.b. Replicate an experiment and compare the results of data collection 	
C.12.5. Use the explanations and models found in the earth and space, life and environmental, and physical sciences to develop likely explanations for the results of their investigations	<ol style="list-style-type: none"> 1. Complete an investigation 2. Develop explanations for investigation results based on explanations and models of science 	<ol style="list-style-type: none"> 1.a. Design, complete, and record the results of an investigation involving the exposure of several eggs to varying environments 2.a. Explain the results (e.g., why some eggs did or did not hatch) based on scientific models or explanations 	
C.12.6. Present the results of investigations to groups concerned with the issues, explaining the meaning and implications of the results, and	<ol style="list-style-type: none"> 1. Present the results of an investigation 2. Interpret the results of an investigation 	<ol style="list-style-type: none"> 1.a. After completing an investigation, design and complete a presentation of it 2.a. Summarize the results of the investigation in a way the audience will comprehend 	

answering questions in terms the audience can understand	3. Answer questions in terms the audience can understand	3.a. Collect audience questions in a question box and answer them after group discussion	
C.12.7. Evaluate articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design	1. Establish parameters for evaluating articles and report 2. Evaluate an article or report based on established parameters	1.a. Design a rubric or grading scale to evaluate data 2.a. Read the article or report given and complete a rubric or checklist to judge it	